GO Committee #3
January 29, 2015
Worksession

MEMORANDUM

January 27, 2015

TO: Government Operations and Fiscal Policy Committee

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SUBJECT: **Follow Up to Office of Legislative Oversight Report 2014-6: *Change Orders in County Construction Projects***

Last year, the Council released Office of Legislative Oversight (OLO) Report 2014-6: *Change Orders in County Construction Projects*. The report describes the change order process for County Government capital facility construction projects and examines the regulatory framework and practices that govern change orders. In addition, the report provides case studies detailing the change orders for six completed facilities. Finally, the report identifies methods used by state and local governments to assess and mitigate the risk associated with capital project construction contract change orders.

Select Findings and Recommendations

The Executive Summary for Report 2014-6 – including a complete list of OLO findings and recommendations – appears on © 1-3. For the purposes of the January 29 worksession, OLO highlights the following two findings.

***Finding*: Certain types of capital projects are particularly susceptible to plan modifications during the construction phase, and as a result, bear a higher risk of cost increases and delays.**

Projects with complex or specialized architectural and engineering requirements often involve additional risk of unanticipated change – unforeseen events are more likely to occur when designing and constructing facilities which are dissimilar to other facilities recently built by the County. The risk of plan errors and omissions may rise when a facility design involves a level of complexity and specialization that is unlike other projects.

Conditions at the construction site constitute another potential risk factor. In general, projects located at redeveloped sites or on previously disturbed land run a higher risk of encountering subsurface problems such as subterranean rock, contaminated soils, and underground storage tanks. Moreover, when performing construction at a previously developed site, a project is necessarily affected by pre-existing conditions including the location of utility lines and other underground structures, stormwater drainage patterns, and surrounding vehicle and pedestrian networks.

Renovation projects present further risk resulting from the integration of new construction with pre-existing elements of the building. Renovation projects often encounter deficiencies in the materials and systems retained from the original building.

Finding: Methods exist to mitigate the risk associated with change orders. These methods often involve higher expenditures at the outset in order to contain costs during the construction phase.

Some jurisdictions require government agencies to conduct a risk assessment before constructing a capital project. A capital construction risk assessment may include an evaluation of potential variables that could necessitate change orders and affect project cost and time. Through the risk assessment process, the government identifies pre-construction measures that mitigate the government's exposure to factors that could produce unanticipated expense and delay. Risk mitigation strategies include:

- Unit Pricing: One strategy to control the cost risk of change orders is to specify unit costs for labor and materials requested through a change order in the original construction contract. Establishing fixed unit prices for potential change order work removes price volatility from the process and thereby controls costs.

- Evaluation of Site Conditions: Unfavorable site conditions (such as poor or contaminated soils, buried utility lines, and underground storage tanks) are one of the primary causes for change orders. Soil borings and other sub-surface testing provide vital information necessary for facility construction but also come at a cost. Conducting extensive pre-construction site testing reduces the risk that change orders will be necessary, but adds cost to the planning and design phase of a project.

- Design Review: Design review is a process of evaluating architectural and engineering plans to identify errors, omissions, and other problems. Extensive review can increase the time and cost of the planning phase of a capital project, but can also yield greater time and cost savings during the construction phase. In one type of design review, third-party reviewers examine design specifications and suggest revisions to improve the product, reduce costs, or save time. Another form of design review, Building Information Modeling, is a computer-based project management tool that converts design plans into three-dimensional form to create a virtual model of the proposed building. Design reviewers can then view the building model and correct design problems, conflicts, or omissions that would occur if the building were constructed as designed.

- Alternative Procurement Practices: In "design-build" contracting, a government enters into a single contract for both the design and construction of a capital project. The design-build approach may prevent unexpected cost increases and delays by requiring the contractor to assume the financial risk for changes in project design. In "construction management at risk" contracting, the government hires a firm in the pre-construction stage to consult on project budget, schedule, and design. During the design phase, the government and the contractor agree on a guaranteed maximum price for the construction work. The contractor assumes the risk of constructing the project as designed for an amount not to exceed the guaranteed maximum price. These alternative procurement methods reduce cost risk to the government, but may prompt bidders to request greater compensation to account for assuming a higher level of risk.

OLO also highlights two recommendations from the report.

Recommendation: Request that DGS establish a capital project risk assessment process.

OLO recommends that the Council request that DGS establish a process to assess and rate the relative cost and scheduling risk of pending capital projects based on the presence or absence of known risk factors. The purpose of this assessment is to identify projects with especially high risk of cost increases and delays at the outset of the contracting process.

Recommendation: Request that DGS selectively employ alternative procurement and contracting methods as necessary to mitigate the cost and schedule uncertainty of high risk projects.

OLO recommends that the Council request DGS to adjust procurement and contracting methods as necessary to mitigate the cost and schedule uncertainty for high risk projects. A variety of strategies exist to mitigate exposure to factors that could produce unanticipated expense and delay. DGS should selectively employ these strategies commensurate with the risk level of the project. For example, a specialized and complex project dissimilar to other County facilities may carry a high risk of design errors and omissions, and thus may be a worthy candidate for an alternative procurement approach such as design-build contracting. While risk mitigation measures may increase the time and cost of the planning phase, nonetheless, these strategies help moderate project uncertainty and can yield greater time and cost savings during the construction phase.

Previous GO Worksession

In April 2014, the Government Operations and Fiscal Policy Committee held a worksession to review Report 2014-6. The Committee received a presentation from OLO and discussed the report's findings and recommendations with the Director and staff of the Department of General Services (DGS). At the conclusion of the worksession, the Committee requested that DGS return at a later date to present the information on the following two items:

1. An outline of the DGS processes use to assess and mitigate cost increase and schedule delay risks for capital construction contracts.
2. An overview of DGS project management practices for specialized and uncommon capital projects.

DGS' responses appear on the following page.

DGS Responses

The Department of General Services prepared the following responses to the questions posed by the GO Committee:

1. Outline of DGS processes to assess and mitigate cost increase and schedule delay risks for capital construction contracts.

OLO Report 2013-8, Managing the Design and Construction of Public Facilities: A Comparative Review, page I of the Executive Summary – Next Step: OLO Report on Construction Change Orders in FY 14, states *"Based on the information compiled for this study, OLO finds the structures and practices used by the Montgomery County Government to oversee the design and construction of public facilities largely aligns with the models and practice used by the other jurisdictions and with the "best practices" literature."*

DGS has the following measures in place to mitigate cost increases and schedule delays during various phases of the project.

1. Perform a facility test fit during the project development stage to ensure that the facility can be built on the site by avoiding site constraints such as wetlands, easements, established forest area, etc.
2. Greater use of soil borings at the building footprint location in relation to type of structure/foundation.
3. Value Management – independent team review of design for constructability and identification of alternative design parameters based on value.
4. Building Information Modeling (BIM) – by using "clash detection" of building components during the design phase, minimize RFIs, Field Orders and Change Orders.
5. Commissioning – performed by third party for building envelope, ADA, HVAC/electrical systems, etc. to ensure proper HVAC/electrical system performance and compliance with ADA requirements.
6. Dr. Checks (Quality Assurance Documentation) – software to document and follow up on all design review comments and issues during design phase of the project.
7. Use of Construction Management (CM) Services – on complex and high dollar value projects to assist in managing risk during design and construction.
8. Multivista (Construction Documentation) – third party consultant to document (with pictures and location) project progress on monthly basis and identify issues.
9. Unit Prices – included in bid package to control cost and avoid schedule delays.
10. Newforma Project Cloud (Interactive Project Management Software) – web-based collaboration and contract administration – catalogs RFIs, ASIs, COs, FOs, CCDs, shop drawings and submittals, meeting minutes, etc.

2. DGS project management practices for specialized and uncommon capital projects.

DGS has in place the following procedures and practices for specialized and uncommon capital projects.

1. Pre-qualification process (REOI followed by IFB) – provides pre-qualification of contractors while maintaining cost competition.
2. Design/Build – For specialized projects, DGS uses the Design/Build project delivery method, e.g. CNG Fueling Station, MNCPPC/MCPS Maintenance Depots at Webb Tract.
3. Construction Management Services – DGS recently contracted with two highly qualified firms for Construction Management Services on specialized and uncommon projects, to provide services such as estimating, design review, Change Order cost and time impact review, constructability analysis, schedule analysis, claim analysis, dispute resolution, and other related services.

Recommended Discussion Items

OLO presents the following discussion questions for the January 29 GO Committee worksession:

1. Does DGS have a method to assess the relative risk levels of different capital projects? In other words, how does DGS determine which projects are particularly susceptible to cost and time variation during the construction phase?

2. In its response to the GO Committee, DGS lists ten techniques to mitigate cost increases and schedule delays. How does DGS determine which techniques to employ in any particular project? What project characteristics warrant use of the various techniques?

3. Historically, the County has not employed the Design/Build project delivery method for large projects. Does DGS intend to expand the use of Design/Build for future large projects? If so, which upcoming projects might be good candidates for Design/Build contracting?

4. In its response to the GO Committee, DGS states that it recently contracted with two construction management services firms. Please detail how does DGS intends to use these contractors? What benefits does DGS expect will result from the use of these contractors?

Change Orders in County Government Construction Projects

OLO Report Number 2014-6 March 18, 2014

The Department of General Services (DGS) manages the design and construction of most County Government capital projects. DGS approves change and field orders to modify the work requirements, cost, and schedule of facility construction contracts. This report examines the change and field order process for County Government capital facility construction projects.

Change Orders and Field Orders

A change order is a written directive to the contractor directing a change in the work within the general scope of the contract. A change order may adjust the contract cost and/or time. DGS also may direct a change in work by another form of written directive known as a "field order." Two factors distinguish a field order from a change order. First, a field order must be the result of "unforeseen and unanticipated conditions." Second, the unforeseen conditions addressed by a field order must warrant "immediate action to mitigate costs or avoid delays." A field order may not modify the contract price.

Construction contract change and field orders are not inherently beneficial or detrimental to the progress of a capital project. The change order process is a method to respond to changing requirements that arise during the construction phase of a project. When managed well, the change order process can offer substantial benefits to a contract manager.

In the absence of a change order process, the original construction contract likely would require a higher payment amount to compensate the contractor for assuming responsibility for addressing unanticipated work requirements.

However, change orders also may result in undesired cost increases and delays. Once an agency has entered into a contract with a construction firm, an opportunity no longer exists to competitively bid changes to work requirements. Rather, by its very nature, the change order process requires the agency to only consider pricing and staffing offered by the contractor (or through a subcontractor).

Factors that Cause Change and Field Orders

Multiple conditions precipitate the need for a construction contract change or field order.

- Site Conditions: Projects located at redeveloped sites or on previously disturbed land run a higher risk of encountering subsurface problems such as subterranean rock and contaminated soils. In addition, renovation projects present further risk resulting from the integration of newly constructed and older pre-existing elements of the building.
- Errors and Omissions: Facility design plans sometimes include errors and omissions, particularly when the design contractor lacks the specialized expertise to design a complex project.
- Third Party Involvement: Often, facility construction requires coordination with a third party (other than the County and its contractors). Construction progress may be dependent on the performance and requirements of the third party.
- Code Compliance: Regulatory agencies review construction plans and conduct site visits to ensure that the facility is built in compliance with all relevant codes. On occasion, standards change after the completion of construction plans but before the start of facility construction.
- Modified User Requirements: On occasion, the using department will modify the facility requirements after completion of the architectural and engineering plans.

Change and Field Orders in Recent County Projects

OLO reviewed the change and field orders documents for 17 capital projects managed by DGS that reached substantial completion in Calendar Years 2009 through 2013. For these projects, change and field orders had a moderate effect on contract costs. Change and field orders aggregated together for all 17 capital projects resulted in an overall increase in contract costs of 8.0%. Eleven projects experienced a change in contract cost of less than 10%. In fact, change orders for two projects resulted in a reduction in final contract costs. A single project, the Council Office Building Data Center Rehabilitation, incurred change and field order cost increases of greater than 20% of contract costs. With the exception of the Council Office Building Data Center and Takoma Park Fire Station projects, the capital budget appropriations for the projects were sufficient to cover the additional cost incurred by change and field orders.

Field orders had a substantially greater effect on contract costs than did change orders. For the 17 projects, field orders had a substantially greater effect on contract costs than did change orders. On average change orders added about $37,400 (or 0.5%) to contract costs. In contrast, field orders added about $569,900 (or 7.5%) to contract costs on average.

For the overall capital program managed by DGS, change orders had a significant effect on the construction schedules. In the aggregate, change orders for the 17 projects studied increased the overall construction time by 30.3%. Of the 17 projects, just under half (47%) had increases in contract time resulting from change orders of less than 10%. For two projects, change orders extended the contract time by 10% to 20%. For the remaining seven projects, change orders extended contract time by more than 20%. Two projects (COB Data Center and Mid-County Community Recreation Center) experienced delays that more than doubled the construction time period.

Foreseeable and Unforeseeable Risk

Change and field orders are caused by a variety of factors, some of which are unforeseeable and uncontrollable. In several recent projects managed by DGS, the cost increases and delays were the result of unforeseeable conditions and uncontrollable events, including:

- a large and experienced construction contractor declared that it would cease business operations while working on an ongoing project;
- a previously reliable supplier delivered improperly manufactured building materials; and,
- a local utility modified code requirements while a capital project was under construction.

In each of these cases, the unforeseen condition or uncontrollable event necessitated execution of change and field orders to allow project construction work to proceed.

With some adverse conditions cannot be foreseen, one can anticipate that certain types of projects are particularly susceptible to plan modifications during the construction phase. Projects with complex or specialized design requirements bear a higher risk of cost increases and delays. Of the 17 projects studied, the one that experienced the greatest cost increase and time delay was a project unlike any other County project, the COB Data Center Rehabilitation. Design of this project was performed initially by an architectural and engineering contractor that lacked the specialized expertise. As a result, the construction phase of the project required a substantial extension of time (more than a year) to correct design errors.

DGS recently began to compile and maintain project-specific data on the effects of change and field orders on changes contract cost and time. At the outset of this study, DGS did not maintain project-specific data on the effect of change and field orders on contract cost and time. Concurrent with the OLO study, DGS began to develop and maintain project-specific change and field order data. The availability of this data may help identify factors that raise the risk of project cost increases and delays.

Risk Assessment and Mitigation

Some jurisdictions require government agencies to conduct a risk assessment before constructing a capital project. A capital construction risk assessment may include an evaluation of potential variables that could necessitate change orders and affect project cost and time. Through the risk assessment process, the government identifies pre-construction measures that mitigate the government's exposure to factors that could produce unanticipated expense and delay. Risk mitigation strategies include:

- Unit Pricing: A government can control the cost risk of change orders by specifying unit costs for labor and materials in the original construction contract. Establishing fixed unit prices for potential change order work removes price volatility from the process.
- Evaluation of Site Conditions: Sub-surface testing provides vital information necessary for facility construction. Conducting extensive pre-construction site testing reduces the risk that change orders will be necessary but adds cost to the planning and design phase of a project.
- Design Review: Design review is a process of evaluating architectural and engineering plans to identify errors, omissions, and other problems. Extensive review can increase the time and cost of the planning phase of a capital project but can also yield greater time and cost savings during the construction phase. In one type of design review, third-party reviewers examine design specifications and suggest revisions to improve the product, reduce costs, or save time. Building Information Modeling is a computer-based tool that converts design plans into a virtual model that allows reviewers to better identify and correct design problems.
- Alternative Procurement Practices: In "design-build" contracting, a government enters into a single contract for both the design and construction of a capital project. The design-build approach may prevent unexpected cost increases and delays by requiring the contractor to assume the financial risk for changes in project design. In "construction management at risk" contracting, the government hires a firm to consult on project development and to assume the risk of constructing the project for a pre-determined guaranteed maximum price. These procurement methods reduce cost risk to the government but may prompt bidders to request greater compensation to account for assuming a higher level of risk.

Office of Legislative Oversight Recommendations

OLO offers the following three recommendations for Council action.

1. ***Request that DGS establish a capital project risk assessment process.***

The Council should request that DGS establish a process to assess and rate the relative cost and scheduling risk of pending capital projects based on the presence or absence of known risk factors such as those listed above. The purpose of this assessment is to identify projects with especially high risk of cost increases and delays at the outset of the contracting process.

2. ***Request that DGS selectively employ alternative procurement and contracting methods as necessary to mitigate the cost and schedule uncertainty of high risk projects.***

The Council should request DGS adjust procurement and contracting methods as necessary to mitigate the cost and schedule uncertainty for high risk projects. DGS should selectively employ risk mitigation strategies commensurate with the risk level of the project. While risk mitigation measures may increase the time and cost of the planning phase, these strategies nonetheless help moderate project uncertainty and can yield greater time and cost savings during the construction phase.

3. ***Encourage DGS to continue to collect and monitor project-specific change and field order data to track trends and to identify factors that raise the risk of cost increases and schedule delays.***

The Council should encourage DGS to continue to compile and monitor change and field order data for each capital project. This data could help identify change order risk factors.